Arginase deficiency

Description

Arginase deficiency is an inherited disorder that causes the amino acid arginine (a building block of proteins) and ammonia to accumulate gradually in the blood. Ammonia, which is formed when proteins are broken down in the body, is toxic if levels become too high. The nervous system is especially sensitive to the effects of excess ammonia.

Arginase deficiency usually becomes evident by about the age of 3. It most often appears as stiffness, especially in the legs, caused by abnormal tensing of the muscles (spasticity). Other symptoms may include slower than normal growth, developmental delay and eventual loss of developmental milestones, intellectual disability, seizures, tremor, and difficulty with balance and coordination (ataxia). Occasionally, high protein meals or stress caused by illness or periods without food (fasting) may cause ammonia to accumulate more quickly in the blood. This rapid increase in ammonia may lead to episodes of irritability, refusal to eat, and vomiting.

In some affected individuals, signs and symptoms of arginase deficiency may be less severe, and may not appear until later in life.

Frequency

Arginase deficiency is a very rare disorder; it has been estimated to occur once in every 300,000 to 1,000,000 individuals.

Causes

Mutations in the *ARG1* gene cause arginase deficiency.

Arginase deficiency belongs to a class of genetic diseases called urea cycle disorders. The urea cycle is a sequence of reactions that occurs in liver cells. This cycle processes excess nitrogen, generated when protein is used by the body, to make a compound called urea that is excreted by the kidneys.

The *ARG1* gene provides instructions for making an enzyme called arginase. This enzyme controls the final step of the urea cycle, which produces urea by removing nitrogen from arginine. In people with arginase deficiency, arginase is damaged or missing, and arginine is not broken down properly. As a result, urea cannot be produced normally, and excess nitrogen accumulates in the blood in the form of ammonia. The

accumulation of ammonia and arginine are believed to cause the neurological problems and other signs and symptoms of arginase deficiency.

Learn more about the gene associated with Arginase deficiency

- ARG1

Inheritance

This condition is inherited in an autosomal recessive pattern, which means both copies of the gene in each cell have mutations. The parents of an individual with an autosomal recessive condition each carry one copy of the mutated gene, but they typically do not show signs and symptoms of the condition.

Other Names for This Condition

- ARG1 deficiency
- Arginase deficiency disease
- Argininemia
- Hyperargininemia

Additional Information & Resources

Genetic Testing Information

- Genetic Testing Registry: Arginase deficiency (https://www.ncbi.nlm.nih.gov/gtr/conditions/C0268548/)

Genetic and Rare Diseases Information Center

- Arginase deficiency (https://rarediseases.info.nih.gov/diseases/5840/arginase-deficiency)

Patient Support and Advocacy Resources

- Disease InfoSearch (https://www.diseaseinfosearch.org/)
- National Organization for Rare Disorders (NORD) (https://rarediseases.org/)

Research Studies from ClinicalTrials.gov

- ClinicalTrials.gov (https://clinicaltrials.gov/ct2/results?cond=%22arginase+deficiency%22+OR+%22Hyperargininemia%22)

Catalog of Genes and Diseases from OMIM

- ARGININEMIA (https://omim.org/entry/207800)

Scientific Articles on PubMed

- PubMed (https://pubmed.ncbi.nlm.nih.gov/?term=%28arginase+deficiency%5BTIAB%5D%29+AND+english%5Bla%5D+AND+human%5Bmh%5D+AND+%22last+3600+days%22%5Bdp%5D)

References

- Ah Mew N, Simpson KL, Gropman AL, Lanpher BC, Chapman KA, Summar ML. UreaCycle Disorders Overview. 2003 Apr 29 [updated 2017 Jun 22]. In: Adam MP, Ardinger HH, Pagon RA, Wallace SE, Bean LJH, Mirzaa G, Amemiya A, editors. GeneReviews® [Internet]. Seattle (WA): University of Washington, Seattle;1993-2021. Available from http://www.ncbi.nlm.nih.gov/books/NBK1217/ Citation on PubMed (https://pubmed.ncbi.nlm.nih.gov/20301396)
- Crombez EA, Cederbaum SD. Hyperargininemia due to liver arginase deficiency. Mol Genet Metab. 2005 Mar;84(3):243-51. Epub 2004 Dec 19. Review. Citation on PubMed (https://pubmed.ncbi.nlm.nih.gov/15694174)
- Endo F, Matsuura T, Yanagita K, Matsuda I. Clinical manifestations of inbornerrors of the urea cycle and related metabolic disorders during childhood. JNutr. 2004 Jun; 134(6 Suppl):1605S-1609S; discussion 1630S-1632S, 1667S-1672S.doi: 10.1093/jn/134.6.1605S. Review. Citation on PubMed (https://pubmed.ncbi.nlm.nih.gov/15173438)
- Scaglia F, Brunetti-Pierri N, Kleppe S, Marini J, Carter S, Garlick P, Jahoor F, O'Brien W, Lee B. Clinical consequences of urea cycle enzyme deficiencies and potential links to arginine and nitric oxide metabolism. J Nutr. 2004 Oct;134(10 Suppl):2775S-2782S; discussion 2796S-2797S. doi: 10.1093/jn/134.10.2775S. Review. Citation on PubMed (https://pubmed.ncbi.nlm.nih.gov/15465784)
- Sun A, Crombez EA, Wong D. Arginase Deficiency. 2004 Oct 21 [updated 2020 May 28]. In: Adam MP, Ardinger HH, Pagon RA, Wallace SE, Bean LJH, Mirzaa G, Amemiya A, editors. GeneReviews® [Internet]. Seattle (WA): University of Washington,Seattle; 1993-2021. Available from http://www.ncbi.nlm.nih.gov/books/NBK1159/ Citation on PubMed (https://pubmed.ncbi.nlm.nih.gov/20301338)

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